JOHN WEISS & SON, LTD.

A NEW SCOTOMETER.

By Col. R. H. Elliot, I.M.S.

PARTICULARS ON APPLICATION.

SOLE MAKERS—

JOHN WEISS & SON, LTD.,

287, Oxford Street, London, W.1.

Instrument Makers to the Royal London Ophthalmic Hospital (Moorfields) and to the principal British and Colonial Hospitals.

CONTRACTORS TO H.M. GOVERNMENT.

Special Orders and Repairs executed with promptitude.

THE BRITISH JOURNAL
OF
OPHTHALMOLOGY

DECEMBER, 1919

COMMUNICATIONS

COLOBOMATOUS AND MICROPHTHALMIC EYES*

BY

DR. G. M. VAN DUYSE, JR.

True colobomata of the rudimentary optic nerves (glial plaques), aplasia of their retro-ocular segment, gliosis of colobomatous cyst, supernumerary nuclear arcs, entropion of the borders of the iris.

The specimens were derived from a rabbit one year old, fixed in Müller's fluid, and the sections stained in haematoxylin and eosin. The eye was placed in the ophthalmological collection of the University in the year 1901.

Left eye. — Dimensions: antero-posterior diameter, 13 mm. Equatorial diameter, 18 mm. The section plane was begun horizontally, as far as the lower segment of the lens; thence it was continued in the frontal plane, parallel to that of the iris.

Figure 1 takes the place of a long topographical description: the condition is one of a typical coloboma involving the iris, the ciliary region, the membranes of the ocular floor, viz., a choroido-retinal coloboma including the papilla.

Left Eye.—In this eye the interesting point is the arrangement of the mesodermic tissue surrounding the hyaloid artery and occupying

*From the Ophthalmological Laboratory of the University of Ghent: Director, Professor D. van Duyse. Translated by E. E. H.

the primary optic peduncle, which is under-developed and separated from the brain (total aplasia of the intra-orbital optic cord).

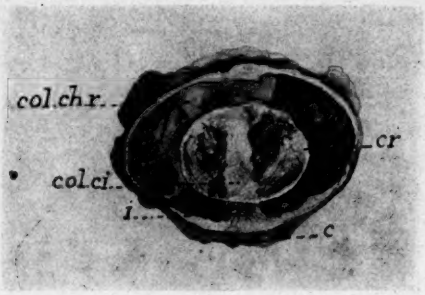


FIGURE I.

Description.—*Left eye*: horizontal section, magnified 2 diameters, *I.*, coloboma o the iris and ciliary body, *col. ci.*, joining on to a coloboma, *col. ch. r.*, choroido-retinal coloboma of the floor; *cr.* lens : *c.* cornea.

Let us examine a horizontal section (Fig. 2) passing under the optic peduncle: the section is through the fibrous mass in its most advanced position towards the lens, *c. hy.*, which starts from the thickened scleral tissue situated behind the posterior pole. Let us call this band *c. hy, the hyaloid system.* It is the analogue of one of the thick fibrous bands sheathing the hyaloid artery, and described in the observation by us of *cyclopean microphthalmos.**

That mesodermal fibrous mass, the anterior parts of which are made up of embryonic young cellular connective tissue, has a trapezoidal shape (Fig. 2). It attains its greatest size in the posterior part, or base; it gets smaller as it comes forward into the ocular cavity; it expands as it bends from the nasal side N (see figure above) and stretches out to embrace the back of the lens *cr.* The arterial trunks contained supply a vascular capsule *c.* to this area, which is directed towards the equator of the lens.

The hyaloid system reaches, as we have said, its greatest transverse size at the level of Figure 2 under the optic penduncle. It is covered on its nasal and temporal (inferior in the figure) sides by the inverted retina R^1. There is to be noted an interruption in the retinal folds at the level of that mesodermal mass and on its ventral part *the mesodermal cone* interposed in the peduncular gap at this level can be recognized, and is represented in a series of frontal sections, notably in Figures 6 C, D, E.

The first sections of the inferior segment of the eye (horizontal bisection of the globe) do not contain the dorsal sections of the bulbar peduncle. It was not possible to examine the superior bulbar

**Arch. Méd. belges*, fig. 6, June, 1919.

segment. Since the inferior segment of the eye was somewhat larger than the superior, it may be admitted that Figure 3 corresponds to a raised segment of the optic peduncle, and it may be supposed that the separation into segments ceases as in the similar eye (Figure 12).

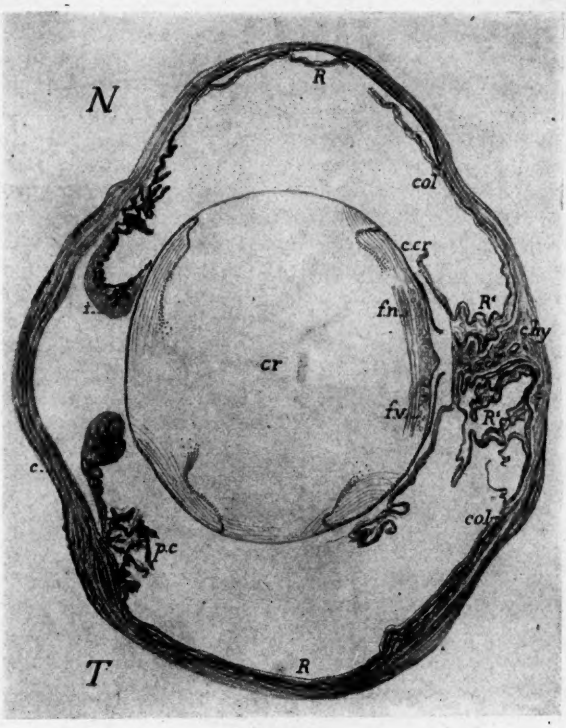


FIGURE 2.

Description: *Hyaloid system. Entropion of iris (at the level of the iris coloboma).* Horizontal bisection above the optic peduncle—magnified 6 diameters. ***Col. col.***, nasal limits and temporal limits of the choroidal-retinal coloboma; R^1. colobomatous retina; *c. hy.*, atypical hyaloidean connective tissue; *R.*, retina outside the coloboma; *f.n.*, normal fibres, and *f.v.*, vesicular fibres of the lens, *c.r.*; *p.c.*, ciliary process; *i.*, iris; *c.*, cornea (the representation of the iris is borrowed from a section lower down). *N*, nasal side; *T*, temporal side.

The hyaloid system contains in its ventral part the main arterial trunk which ascends from below upwards, and in its windings gives off multiple and convoluted branches. The nasal part contains at the same level some bands of striated muscular fibres.

Optic Peduncle

Figure 3 represents the most extensive part of the hypoplastic optic nerve *n.o.*, *n.o.*,[1] *n.o.*[2] The hyaloid band *t. hy.*, reaches its minimum size and disappears ten sections higher; these optic segments become fused together. In reality the mesodermal cone stops before reaching the roof, at the dorsal part of the peduncle.

FIGURE 3.

Description: *Optic peduncle, partition of hyaloid tissue and vascular capsule* (Left eye: horizontal section; obj. 3, oc. 3; reduction 5 : 3). N.o., n.o[1], n.o.[2] optic peduncle divided by the partition, *t. hy* of interpeduncular hyaloid tissue; *R*, extra-colobomatous retina; *R. col*, colobomatous retina; *c. va*, vascular capsule; *c. cr*, lens capsule; *s*, sclera; *N* and *T*, nasal and temporal sides.

In Figure 3 the optic nerve occupies its greatest transverse area, at the level of the dorsal part of the peduncle. The segments *n.o.*, *n.o.*,[1] *n.o.*[2] are at this point separated only by some neuroglial fibres forming a sheath or slight partition. The segment

n.o. takes a more marked pouch-like shape; the segment $n.o^1$ and the small subjacent segment coalesce; the segment $n.o^2$ in its turn joins the other segments.

From the two swollen extremities of the pouch of the segment *n.o.* (Fig. 3) issue the retinas, of which one rejoins the intrabulbar retina *R*, the other *R, col* covering the posterior temporal scleral wall.

The character of the optic peduncle *n.o.*, $n.o.^1$ $n.o.^2$ is as follows: from the prolonged segment $n.o^2$ with antero-posterior axis, arises a retina, a thin band of retina completely glial, one of whose extremities rejoins the ectatic posterior scleral wall, and the other, in front, the extra-colobomatous retina *R*. If the special histological arrangement of the temporal segment $n.o.^2$ was not completely similar to that of the nasal segment, we might consider we were dealing with a weak enlargement, with a retina in which the layers of nuclei more or less undifferentiated, as in some undifferentiated retinas, are situated on the adherent side and whose fibres of Müller come off from the free side, but these layers of nuclei are nuclear columns, similar to those of the neighbouring segment *n.o*, the colouration and constitution of which are the same: the segments of the rudimentary nerve are sharply differentiated by their fundamental compact glial substance from the spongy and oedematous colobomatous and extracolobomatous retina. The fundamental texture of the optic peduncle consists in a web of glial fibres derived from the glial cells which occupy the centre or wall of a little alveolus (oedema). These cavities give a spongy appearance to the nerve. The glial fibres tend to stretch in the same direction: for the anterior segment of the nerve, *n.o*, following the transverse axis *N T*; for the posterior segment, the direction is almost perpendicular to the preceding; in the segment *n.o*, the fibres run in the grand axis, antero-posterior, and in the segment $n.o^2$, the direction is perpendicular to the grand axis, consequently transverse. The directions of these fibres is the same as that given by the spindle-shaped fibres, fusiform connective tissue cells provided with isolated, double, elongated nuclei, flanked by stellate cells, whose most apparent processes also run in the same direction. These are bands of connective tissue cells which, placed at intervals, give a striation converging more or less toward the heel of the pouch of *n.o*, and are the analogues of the partitions derived from the glial sheath of a normal nerve. A pial sheath here surrounds the peduncular segment. These partitions support the nutrient capillaries which run in a direction perpendicular to their own. These latter are, then, as in the normal eye, borne in longitudinal partitions rich in nuclei. The term hypoplasia given to the optic nerve postulates *the total absence of optic fibres*. The nerve would be complete without that, inasmuch as it

is provided with a vaginal sheath in which partitions carry capillaries. The nasal segment of the optic peduncle is enclosed by the scleral sheath, forming a dural sheath, and further forward by the hyaloid connective tissue, forming, in the shape of a transverse layer, a strong substratum for the vascular capsule *c.va.*

Retina: the absence of optic fibres and central vessels in the optic peduncle necessitates *a priori* absence of fibres and of vessels derived from the central artery in the extracolobomatous retina, and *a fortiori* in the colobomatous retina. The extracolobomatous retina (0.16 mm. thick), with the exception of these elements, contains the other parts that compose the normal retina; the degenerate ganglion cells of dimensions a little greater than the neighbouring glial cells, which are not numerous, are feebly stained. The retina measures from 0.05 to 0.2 mm. after taking into account the obliquity of the sections. As it covers the scleral ectasia in Fig. 3 there is to be seen: 1, the external limiting membrane with rods and cones turned towards the vitreous; 2, a nuclear layer; 3, a granular layer; 4, A layer with large meshes, of fibres and glial cells, meshes and alveoli of oedema; 5. Some ganglion cells transformed into angular hyalin blocks, with short, thick, hyalin processes and a nucleus very faintly stained with haematoxylin. It is characterized by its spongy state. The oedema is particularly marked, not in the peripheral parts of the extra-colobomatous retina, but in the part which decorates the perihyaloid territory, which is deprived of choroid and pigmentary epithelium and consequently is colobomatous. The retinal structure here consists of an irregular web of glial meshes where the nuclei are scattered in irregular groups. The alveoli occupy specially the middle layers of the retina. It is also at this level that the areas of oedema are most marked. The thickness of these layers varies greatly. The cones and rods are absent from the colobomatous segments; there is generally an irregular nuclear layer; rarified ganglion cells are present; optic fibres and vessels are absent; Müller's fibres are accentuated.

The extracolobomatous retina is provided with rods and cones and with two nuclear layers, but, as in the preceding case, neither optic fibres nor vessels. Moreover, it is not oedematous.

Vitreous body.—This makes its appearance in the form of fine, retracted, dichotomous tongues which run along the limiting membrane between the folds of the retina (Fig. 3).

Lens (Fig. 2).—The peripheral fibres, especially those of the posterior cortical layer, are vesicular. The capsule is ruptured at the posterior pole, and a plug of granular substance, derived from the disintegrated lens matter, issues from the solution of continuity and forms a hernia in the capsular wound. A relatively discrete degeneration of the vitreous is present about the peripheral fibres of the shell. Their course is still more

distinct at the level of the nuclear zones, four in number: two anterior and two posterior. The drawing (Fig. 2) slightly schematic of the lens (nuclear arcs drawn with a higher eyepiece) enables us to dispense with a detailed description.

The epithelium of the anterior capsule reaches to the nuclear zones or arcs, open in front and situated in front of the equator. The two nuclear arcs, open behind, join with the pseudo-epithelium of the posterior capsule. (The posterior temporal nuclear arc is taken from a section lower down in the series. That region was completely vesicular at the level of section of the other arcs.)

The coloboma of the iris is large and complete: the edges diverge slightly. In the first sections, at the level of the horizontal diameter of the iris, the pigmented epithelium does not reach the level of the stroma. The latter tends to constitute more and more the pupillary border and to reproduce the appearance shown by Figs. 4 and 5.

FIGURE 4.

FIGURE 5.

Description: *Sections of the inferior segment of the iris coloboma.* Folds of epithelium and radiating arrangement of the sphincter muscle, rarefied in the sections situated lower than 6 A.

This configuration becomes progressively more complex: the epithelium is frequently folded upon itself, it winds and is surrounded by segments of unstriped muscular fibres to which it gives origin. That arrangement of epithelium and of sphincter gives the key to the entropion of the pupillary border.

It is to be noted that in the upper half of the iris coloboma, the iris has a normal thickness, and that the two surfaces run parallel with each other. The thickness of the edge appropriate to the normal eye is shown in the lower half of the coloboma: the iris becomes clubbed as Bock has observed it. He states that the pigment epithelium is strongly developed, that the folds and warty thickenings appear on the posterior surface. In the colobomatous eyes studied by Bock (notably cases I, III, IV) the pigmented border bends forward and forms an ***ectropion of the pupillary border.***

The ***entropion*** of the edge of the iris reappears in the frontal sections (see figure 6, A). The sphincter fibres are absent at present; they had become scanty in the later horizontal sections (Figure 5). Descemet's membrane and the endothelium which covers it are stretched over the scleral background to be lost in the angles of the anterior chamber, represented by a long gap. The scleral surface, where it reaches the iris coloboma, is raised by a muscular mass *m*, which has taken the place of a band and which has formed the concave impression represented in the figure B beneath the ciliary surface.

The two pillars of the iris in Figure A rapidly approach each other, become thin and coalesce at the level of the middle line, so causing the formation of a band of pigmented iris tissue which lies on the lens capsule at the sides, while the pigmented epithelium of the deep fold of the iris masses on the sides and rejoins the neighbouring ciliary processes shown in B.

The iris band further diminishes in thickness, the ***ciliary coloboma*** succeeds that of the iris, diverging slightly from the middle line, and the observer notes the constitution of a mesodermal cone *c. m*, coming from an atypical scleral tissue (compare Figure 6, C) where it is clearly defined.

Before the ciliary region is so sharply raised, the ciliary coloboma is marked out at the sides by processes, in reality reduplications of the pigment epithelium; a layer of retinal tissue, glial and very undifferentiated, appears: this is the beginning of the ***choroido-retinal*** coloboma. The drawn back retinal epithelium expresses the size of the coloboma of the ocular floor.

At the place where the mesodermal cone is strongly marked, a reduplication of the retina appears on its sides, better marked on the right: colobomatous retina *R Col* adherent to the sclerotic, retina R^1 inverted beyond; normal retina *R* doubles itself with the pigmented epithelium and the choroid. The colobomatous retina is reduced to a glial layer with scattered nuclei and rises on the cone to be lost on the other slope towards which also advance an everted retina which is terminated by two or three layers of folded ciliary retina; the pigmented epithelium interrupted at the edge of

the coloboma, on the left, reappears in a fragmentary condition under the retinal reduplication of that side.

Figure 6, D represents the colobomatous retinal reduplications situated a little further back and the edges of the choroido-retinal coloboma.

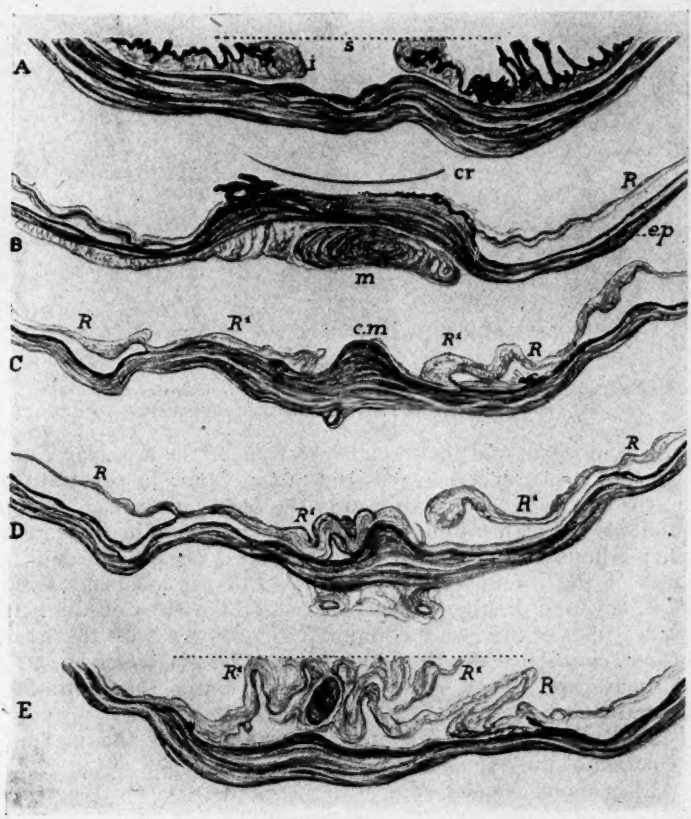


FIGURE 6.

Frontal sections of the colobomatous ocular floor. A. Coloboma and entropion of the edge of the iris i; s, line of section of the last horizontal cut. *B. Ciliary coloboma;* cr, lens capsule; *R*, retina and *ep*, retinal epithelium; *m* muscular mass. *C.D.E.* Choroido-retinal coloboma at different levels. *R, R* extra colobomatous retina; R^1, R^1, colobomatous retina reduplicated; *c.m*, mesodermal cone reaching behind to the hyaloid system *h* (compare h in figure 7, horizontal section).

The same description applies to Figure E. The mesodermal cone is less voluminous, narrowed at the base, and has just left the atypical scleral surface.

On passing to the examination of the inferior horizontal sections we find a picture sensibly similar to that of figure E, frontal section as the last; the mesodermal cone reappears in the same form, detached from the scleral wall. We already know it under the name of the hyaloid connective tissue system.

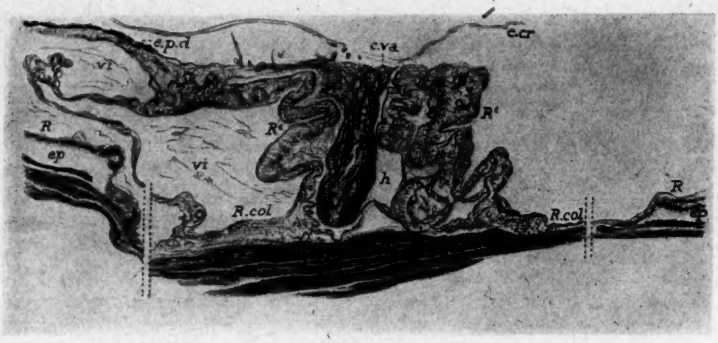


FIGURE 7.

Inferior horizontal section of *the cone or hyaloid mesodermal vascular system*. To be compared with Figure 6 E, frontal and posterior.

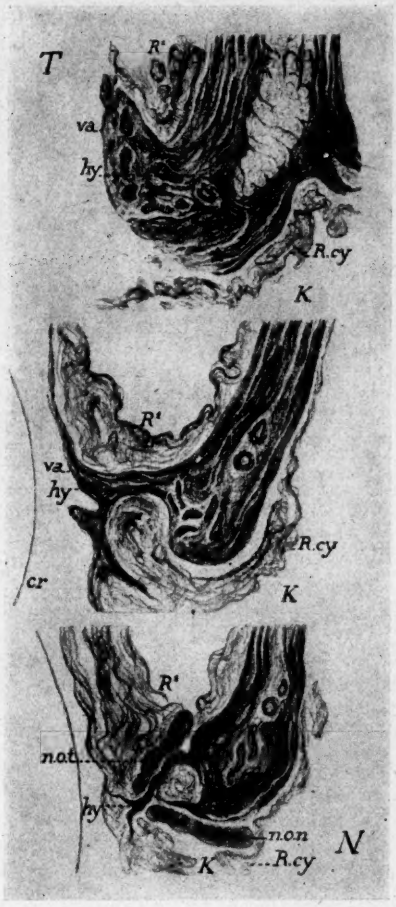
Here we again find the terminal plateau of the vascular capsule *c.va*, that is left by certain vessels on their course to penetrate into the vitreous to be directed towards the lens capsule *c.cr*; reduplications of the pigment epithelium, *e.p.d.*, are found in front of the retina where it is in contact with the lens, *c.cr.* on the left; the edges of the coroido-retinal coloboma $R.R^1$; colobomatous retina *R.col.* covering on the left the bottom of the floor of the ectatic sclera; folds of the inverted retina R^1 in contact with the hyaloid system, connective sheath of the hyaloid vessels, *which is only the continuation of the mesodermal cone* interrupting the continuity of the retina at its level.

Right eye. The essential teratological point is the method of formation of the hypoplasic optic nerve.

Other anomalies described in the associated eye are here found again, notably *the entropion of the edge of the colobomatous iris, the ciliary coloboma*, and *the choroido-retinal coloboma*, all typical. The latter is very extensive: it reaches very far forward to the *level of the coloboma* in the ciliary processes, and stretches to the equator on the nasal side, and to the upper limit of the peduncle of the optic nerve; it is complicated by a cystic ectasia at its entrance on the nasal and inferior nasal sides.

At the same time the mesodermal cone, the raised rib or crest springing from the ocular floor at the level of the ancient foetal

cleft, is missing, except behind, where the mesodermal tissue has caused an atypical disturbance at the level of the optic peduncle to be described.



FIGURES 8, 9, 10

Description: *Peduncular hyaloid system*, *hy*. (Obj. 3, oc. 2; reduced 3:2. The mesodermal cone carrying the hyaloid artery (peduncular *hy*), immediately of large size (Figure 8), is engaged in a spur between the retinal folds R^1 (Figure 9) and penetrates into the optic peduncle which it divides (Figure 10) into two segments *n.o.t.* and *n.o.n.*; *R. cy*, retina in the colobomatous cyst *K*; *va*, vascular capsule; *cr*, lens capsule; T and N, temporal and nasal sides.

The retroscleral orbital optic cord does not exist. The peduncle is disposed almost entirely *in front* and above the mesodermal hyaloid system.

An essential point of difference between the peduncle of the left and that of the right eye is the existence, at the point where the former reaches its greatest size (Figure 3) of the hyaloid plateau in front of the optic peduncle, while in the latter the reverse is the case (Figures 11 and 12). The peduncular mass of a quite unusual shape is placed in front and turns below to engage in the neck of the sub- and retro-peduncular cystic ectasia, to arrest us on a basis of anatomical relations, a real idea that pathological examination compels us to modify by employing the qualification of intra-peduncular.

The hyaloid peduncular system hy is at the point under consideration a fibrous tissue whose nasal part limits the neck of the colobomatous ectasia K (Figure 8) and whose temporal part opens out into the vascular plateau *va*, the base of the vascular lens capsule.

The sides of this protuberant mass are bordered on the temporal sides by retinal folds R^1 and on the nasal side by the retina as it penetrates the neck of the cyst *R.cy* (Figure 9) or by the rudimentary optic nerve's nasal segment *n.o.n.* (Figure 10).

The connective mass becomes smaller as it rises in the series of sections (Figure 9) and two peduncular glial nervous segments appear, at present separated by a conical mesodermal partition (Figure 10).

That partition after dividing into two parts of approximately the same size precedes the appearance of the optic nerve which is completely aplasic (Figure 11). This then appears, free in front, and giving out segments of retina at its temporal extremity, while its nasal extremity takes refuge in the cystic recess (Figure 12).

The nerve or optic peduncle occupies in its upper part a transverse position in front of the atypical scleral tissue where the hyaloid tissue which it had divided lower down is lost. This transverse position, naso-temporal, follows an angular form, a fibrous conical prolongation separating the glial plaque into two segments. The temporal segment looks forward; the nasal segment looks down until it is placed into the cystic neck. The former segment becomes slightly concave forwards in Figure 11 and 12; the other looks forwards to become concave backwards as it bends over the enlargement (Figure 11, *n.o.*) that we will call temporal cone of the cystic neck *c.t.* (Figure 12), and the other part nasal cone *c.n.* as the process which limits the neck on the nasal side (on the bottom of the figure, the two cones being marked by an asterisk).

The grand axis of the glial peduncle reaches here to 1·5 mm.;

its thickness is 0.3 mm. The characters of its fundamental structure are the same as in the associated eye :—1 *Glial fibres and cells* with a more or less spongy character ; the fibres do not tend

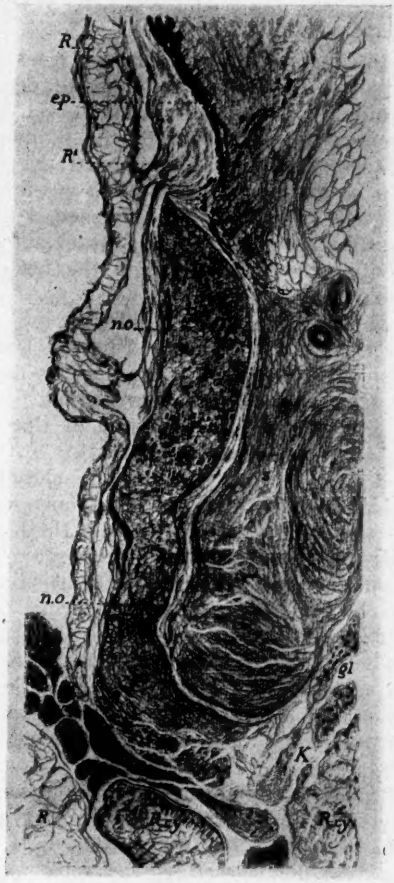


FIGURE 11.

Optic peduncle of the right eye. (Obj. 3, oc. 3, Reduced 5 : 3).
Same lettering as in Figure 12.

in any definite direction. 2. *Connective partitioning fibres*, homologues of the partitions derived from the glial sheath of a normal nerve (rare in the specimen). 3. *Nuclear columns*, carrying scattered capillaries, more numerous on the anterior side. Some

supports, at considerable intervals, leave the posterior surface of the glial sheath of the glial peduncle, and act as partitions which follow the short axis of the peduncle. It is possible to speak of a vaginal space, the dural sheath being represented by a layer of more or less homogeneous connective fibres which surround the bulk of the temporal cone of the cystic neck (*c.t.* Figure 12) and are lost towards the extremity of the nerve where this latter is resolved into masses of glial plaques. A gap separates this layer or dural sheath from another layer of fibres, carrying vessels, and of an equally hyaline nature. It continues the pial sheath of the temporal segment of the rudimentary nerve, and finishes equally at the same level. It is not a question of an intervaginal space: we find no arachnoid supports cut obliquely or across, and furnished with endothelium, but only fibres stretched in the false intervaginal space, and belonging to a common solitary sheath of the nerve whose fibres are artificially separated.

On the opposite side the nerve is directly in contact with the glial tissue of a retina. If the nasal and posterior wall of the cyst, accidentally missing, correspond to the sheaths of the nerve, an idea which the topographic point of view justifies, it is not possible to give anatomical proof from the structure of that wall (? modifications due to age and distension of the cyst).

We do not find here the character of optic sheath described by Bergmeister (1913). On the internal side some irregular fibrous prolongations of the wall penetrate between the fibres of the glial investment. This latter re-enters the culs-de-sac or recesses of the wall, in a fairly intimate union therewith, for it is difficult to define the separation of the two tissues (meso-ectodermic penetration).

At the anterior side the peduncle is resolved into compact glial fibres, forming a network with elongated axial meshes, to constitute a border which separates the optic peduncle from a segment of retina. At its temporal extremity the glial fibres of the nerve mix with the glial fibres forming the internal layer of the fold R^1 inverted retina.

The hypoplasic nerve, bent over, forms with the temporal cone *c.t.* the temporal border of the neck, giving access to the cavity of the cyst *K*, the nasal edge being represented by a band, a process of the nasal cone *c.n.* The wall of the retrobulbar pouch *K* is formed from the external layers of the scleral envelope of the globe. It seems necessary to postulate here a contribution from the mesodermal layer surrounding the optic peduncle at its point of junction. That part of the cystic envelope, considering the interruption caused by the optic nerve, can only be furnished by the anterior wall of the cyst, that which is raised (Figure 10) behind the hyaloid vessels to double the atypical scleral wall at this level.

The communication between the pouch and the bulb is closed by

some retinal folds which penetrate partially into the cystic cavity. Some muscular bands which run along the cystic wall from the nasal side come almost in contact with the parietal intracystic glial tissue as a result of the reduction of the fibrous tissue of that envelope (*fm.*, Figure 12).

At its nasal extremity the intracystic rudimentary nerve, together with the glial meshwork of a segment of retina which follows the same direction, is lost in a neoplastic ***glial tissue***, very different from that usually seen in the retro-palpebral cysts complicating colobomatous microphthalmos. Peduncular and retinal origin are both probable. It consists of glial elements united in a mass at the level indicated, but which are also found elsewhere at the edge of the cystic wall. The following appearances of the internal glial layer of the cyst along the ***anterior*** and ***temporal wall*** of the ***cyst*** (the posterior is missing) are to be noted.

(*a*) Cylindrical elevated cells, slightly regular, which stretch to the level of an eventual gap, from a re-entering angle of the wall, taking a fusiform shape as do their nuclei which are deeply stained (morphological tendency and result of settling).

(*b*) Irregular cubical cells, depressed, with tendency to a fusiform aspect.

(*c*) Stellar cells, astrocytes, voluminous with large oval nucleus (exceptional appearance). These are layers of quiescent glial cells.

Opposite the two first in a recess of the wall there is a border of elements reunited as at the entrance of the cystic neck; these are polymorphous epithelioid elements, resembling those of Ziegler in certain simple carcinomas, indifferent epithelial cells or slightly differentiated by their angular appearance. Their nucleus is irregularly rounded or oval, and karyokinesis may be observed in all stages. The protoplasmic contour of the cell is not always sharply defined. In places where the more deeply stained nuclei are crowded together, the appearance may be described as syncytial. This is a stratum of glial cells in formative activity, a glial hyperplasia, a gliosis. Blocks separated by connective trabeculae which have a marked tendency to become homogeneous and hyaline are also present, but not vessels showing sclerosis or hyaline degeneration. No retrogressive metamorphoses of the cellular protoplasm are noticeable; at the most some nuclei of masses of polymorphous elements show some destructive retrogressions to be explained by the absence of vessels. This glial hyperplasia extends to the glial elements of the internal layers of a segment of retina adjacent to the hyaline blocks at the entrance of the cystic neck.

The smaller breaks or gaps of the cystic wall are invaded by the epithelioid elements: in the gaps they are frayed out and become fusiform in the same way as carcinoma cells in the lymphatic spaces.

There is no connection between the cystic wall and the fibrous trabeculae of the mesoderm that act as partitions, or the glial elements that are in a state of hyperplasia.

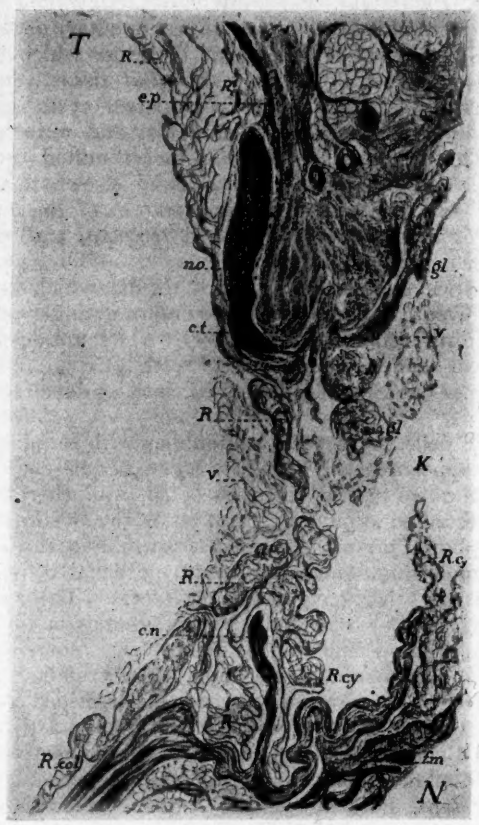


FIGURE 12.

Optic peduncle n.o. and colobomatous cyst K. (Obj. 3, oc. 2, reduced 5:3). *s.* scleral wall rising from the periocular and hyaloid mesoderm. On the temporal side (upper part of the figure), R^1, fold of the retina *R.*; *ep*, fold of pigmented epithelium.

The asterisks (**) mark the neck or isthmus of opening of the colobomatous cyst, between two fibrous processes. Near the inferior recurved segment of the *n.o.*, *gl.*, intracystic gliosis; *R. col.* colobomatous retina; *r. cy*, intracystic retina; *v.*, vitreous or coagulated intracystic fluid; *f.m.*, striated muscular fibres.

Beside the groups of polymorph elements, fusiform elements with long processes are present; with the astrocytes they are directly

reminiscent of the glial cells of certain gliomas or glioses. We shall return later to the epithelioid appearance.

Along the wall in the infero-nasal and nasal parts of the cyst there is found a highly undifferentiated and folded retina. The abnormal and confused arrangement make it impossible to say if it is inverted. No rosettes are to be found in the intracystic retina any more than in the colobomatous and extracolobomatous parts of that structure.

The intraocular fluids such as those of the anterior chamber, vitreous, subretinal and subchoroidal spaces and the cystic ectasia are for the most part coagulated.*

It is most frequently impossible, so much is the retina undifferentiated, to say whether the observed segments are inverted or not, seeing that they contain neither optic fibres nor vessels and that the nuclei are thinly sewn and disarranged by oedema throughout the structure. The determination of the localization of the layers is not at all easy for the extracolobomatous retina which itself is much folded; it is provided with a thick refractile limiting membrane which is also found in the intracystic portion. This, however, is of no use in orientation, for the external limiting membrane is equally thick in that region.

The cystic pouch reaches higher than the peduncle. Figure 12 shows it from behind, deprived of the posterior wall which has been lost in the enucleation. It descends from the infero-nasal side 1.5 mm. lower than the peduncle.

Lens. Alterations are more marked than in the associated eye. The cortical layers are greatly degenerated, both at the equator and poles. The lesions are so advanced that only one defined nuclear zone is left, namely, the superior and anterior temporal. It is also possible to recognize the posterior temporal: the zone of departure at the level of the capsule is but little defined, but its expansion and the fibres corresponding to it are sufficiently marked. The zone of departure of the anterior nasal nuclear arc can also be marked, but the cortical fibres are too much destroyed to allow of the localization of a nuclear arc. Study of the serial sections establishes the existence of an epithelium in front and a pseudo-epithelium behind; in the absence of epithelial cells in a portion of the equatorial region, these appearances allow of the admission of a condition similar to that of the left lens, namely, the existence of four nuclear arcs. The ante-equatorial situation of the anterior nuclear arcs should here again be noted; that of the posterior nuclear zone was carried sufficiently markedly back.

*While making the legitimate distinction between the colobomatous orbital cyst and the colobomatous ectasia, two very different arrangements of the colobomatous evolution of the eye, we mean here by cystic ectasia the real cyst.

Pathogenesis

Before giving a definite opinion on the teratological problem of the two eyes analysed above some brief considerations must be made.

If we must blame the volume of the persisting mesodermal cone at the time when it is interposed between the lips of the foetal cleft, for producing the malformations in relation with its extension, the left eye should show these to a greater extent. The reverse is the case. The mesodermal cone only makes evident a balance behind. It is an awkward situation at the level of the distal extremity of the optic peduncle: a malformation in both eyes and a more considerable echo on the formation of the vitreous of the right side. The development of the optic nerve may be conceived as follows.

The absence of the intraorbital optic cord may be explained, to cut short other hypotheses, by the schema of Spemann.

There remains the distal part of the optic peduncle into which should penetrate normally a hyaloid web and with it the ambient mesodermal cells. Succeeding sections show without doubt that the mesodermal cone, the hyaloid system whose axis is represented by the hyaloid artery, is engaged in that distal part without being absorbed; in the absence of optic fibres the epithelial cells of the peduncle have evolved a neuroglia in which the hyaloid system is engaged in the form of a corner.

In the left eye, it has separated the glial mass into two groups, a temporal group, the most voluminous, and a nasal group, at first transversely spaced, but coming nearer in proportion as the mesodermal cone, erected in a point, diminishes. We thus approach the roof of the dorsal part of the ocular peduncle and find ourselves before the *glial plaque*, best shown as such in the right eye. At this level the mesodermal spur has finished its course: the segments of the glial plaque are only separated on the left side by feeble glial partitions. The situation is analogous in the right eye. The glial plaque has been pushed forward in the form of an angle, the mesodermal cone equally in that direction in the form of a spur. When it is retracted and effaced, the two segments of the optic glial plaque rejoin in an angle pointing forward, the temporal looks in that direction, the nasal is bent over what we have termed the *scleral temporal* cone by analogy with the posterior scleral cone figured by Mannhardt (1897) and penetrates into the canal of the colobomatous cyst. The papilla is necessarily missing in an optic nerve so formed, as Professor van Duyse has observed in connection with the aplasia of the nerve described by him in a cyclops case (1899).

The hyaloid artery with its connective sheath complicates the

development of the vitreous and the nutrition of the lens (vesicular degeneration). On the other hand, as the artery does not develop in the optic cord and the optic fibres do not penetrate it, we find the presence of an undifferentiated retina of the value of a retina of the sixth or seventh week, and whose internal vascularization is missing. The absence of the choroid—it should always reach as far as the retinal epithelium—is a new condition of physiological poverty for the external retinal layers. We must, therefore, not be astonished to find the retina folded, colobomatous, and so to say unrecognizable, so great is the disarrangement of its layers. The absence of optic fibres implies the absence of a papilla as D. van Duyse has demonstrated in a cyclops (1898), an observation also made by Dötsch (1899).

In the left eye, which is slightly microphthalmic, the folding of the retina was less pronounced than in the right, where we had the impression of a space too small for the development of that membrane.

The causes producing the microphthalmia, the coloboma and its determining factor, the mesodermal cone, have produced more marked malformation on the right side. The space in which the retina develops has been all the more restricted since, other conditions being equal, the lens of the rabbit is very voluminous. The mesodermal obstacle to the development of the retina was carried back to the posterior extremity of the foetal cleft. The folds should then be more numerous and complex at this level, as is the case. Since the retinal folding gives rise to a certain degree of scleral ectasia, behind for the left eye and on the temporal side for the right, it produces here, on the nasal and infero-nasal side, the formation of a colobomatous cyst. The retina is pushed at an early stage to the outside of the situation proper for the ocular vesicle. A peri-peduncular and peri-ocular mesodermal envelope, in the guise of a relatively thin wall with winding passages is developed later.

A remarkable mass of mesoderm is found accumulated between the hyaloid artery and the posterior surface of the lens. The secretion of the vitreous fluid falls on the hyaloid vessels and their perivascular glial elements. The quantity formed could only be minimal; the primordial epithelial formative elements of the vitreous (probably retina) could only create a rudimentary vitreous. As a result, especially in the right eye, the folds and the conglomeration of retinal folds between which the vitreous tongues display their bordering of junction.

In all the area where these folds are prominent, the coloboma has been formed; hence the absence of the choroid and the pigmented epithelium and the defective development of the internal layers of the sclerotic. Apart from all increase of intraocular

pressure, an ectasia should tend to develop, a cyst to distend, at this level.

Intracystic gliosis. The origin of this gliosis must be placed in the nasal extremity of the optic plaque, and in the retina which takes refuge with it in the cyst. The three or four known observations, where it is a question of glial hyperplasia in cystic ectasias or in microphthalmic eyes, mention the hypoplasia or total aplasia of the optic nerve. This fact deserves attention, since it seems to establish a relation between the peduncular malformation and the gliosis, without any idea of contesting the retinal origin.

As a matter of fact, there is no essential difference between the peduncular and retinal origin, as both parts are derived from the primordial neural tube.

The hyperplasic glial tissue is most abundant in the neighbourhood of the optic plaque, but it has been directly observed on the internal layer of a stump of retina close to it. Let us recall with Krückman that the neuroglial spider cells only exist in the layer of ganglion cells and optic fibres. The absence of these isolates in some ways the glial cells. We have assumed that the retina under discussion, undifferentiated, was inverted because it had slipped forward into the cystic cavity.

The retinal layers are indistinct ; if we could accurately orientate the retina, the folds found at the entrance to the cyst could only, in our opinion, proceed from the ectropion and folding of the retina.

Theoretically the glial hyperplasia should originate from that internal layer. Let us add that it must have originated soon after the invagination of the secondary optic vesicle, and that that vesicle is not closed in the infero-nasal segment by relation with the rudimentary peduncle. Some of the retinal folds form hernias outside as they lean on the mesodermal cone and being preserved, inverted, from the nasal side of the cyst ; from the temporal side one of them, in concert with the optic plaque, has developed into a moderate gliosis in which the epithelioid aspect recalls its ancestry, but deviating from the type of primordia elements of the neural tube, peduncle and internal leaf of the secondary ocular vesicle. This fact noted in malignant tumours, especially gliomata (epithelial rosettes), is found here in a benign hyperplasia without any heteroplastic extension. It belongs to a simple gliosis and its characters are different from those observed by Bernheimer, Seefelder, and von Hippel. These three observers have studied in microphthalmic eyes glial hyperplasias of a much more marked gliomatous structure, going so far as to simulate a tumour. We will give an analytical account of them.

1. *Bernheimer* (1894). A neoplastic retinal tissue, in relation with some retinal folds, penetrates into the orbit at the level of the

rudimentary obtic nerve, forming a mass of gliomatous tissue rich in nuclei.

2, *Seefelder* (1908). A microphthalmic eye, with orbito-palpebral cyst, colobomatous, is traversed by a vascular cord which traverses the sclera under the *rudimentary optic nerve.* A glial neoplastic tissue, issuing from the retina, accompanies the cord and passes into the orbit to develop there surrounded by a mesodermal shell.

3. *von Hippel* (1895) replies to the question, " Has it been shown that glioma of the retina can be met with in congenital microphthalmos ? " in the negative. The case under discussion was that of a *quasi- tumour-like gliosis* observed in a non-colobomatous microphthalmic eye, with a congenital abnormality of the vitreous. There was noted in addition, *total absence of optic nerve,* plastic irido-choroiditis, with connective and bony formation on the internal surface of the choroid, absorption of the lens. The neoplastic gliomatous mass largely filled the globe.

That neoplastic mass was composed of two distinct parts : a sclerosed hyalinised vascular system (capillaries and arteries) and some cellular groups with haemorrhages and blood spaces filled with blood clot (recent traumatism).

The cellular part consists of nuclei very crowded or widely spaced, oval or fusiform or of long fibrillar cells without any relation to the vessels which do not pass into the cellular islets. They colour with the picric acid element of van Gieson's stain. Consequently they are glial elements.

von Hippel makes the observation that the case of Helfreich (1875), where the optic nerve was missing, is not at all a *glioma* but a *gliosis* (pseudo-glioma), and he gives the same opinion of the anomaly described by Ginsberg (1899).

We assign the cause of the glial hyperplasia to a modification of the relations between the supporting tissue of the retina so largely represented, and the nervous tissue proper, nervous fibres, and ganglion cells.

The physiological ties are thus broken as they are in certain exereses or destructions, which set the epithelial tissue in conflict with the dermal tissue (a typical proliferation of Friedländer).

It cannot be a question of a secondary gliosis consecutive to a chronic inflammatory process, or to a regeneration following a primary regression of the nervous substance of the retina, a natural result of nutritional or circulatory disturbances.

In fact, if we replace the word regression by *absence or non-formation of nervous tissue,* independently of disturbances of circulation and nutrition due to some malformations, we shall understand better the unobtrusive or moderate glial multiplication observed in these cases.

We have stated that the epithelioid glial plaques, which contain

the rudimentary nerve behind and spread along the cystic wall, have only indistinct limits. That peculiarity recalls the syncytial state that Terrien, in his Figure 3, attributed to the internal lining of the cyst that he made originate in the peduncular wall.

We will also recall that in Bergmeister's observation a gliomatous nodule (gliosis) developed in the cavity of one of the eyes, while in our specimen the glial neoplasm is intra-cystic.

Lens. Rindfleisch (1891) describes in a microphthalmic eye (sixth to seventh month foetus) in the horizontal sections made at a certain distance from the centre, *a second posterior nuclear arc*, situated towards the posterior pole, over an area of 2 mm., a peculiarity hitherto undescribed, and bringing the number of arcs up to four, (two anterior and two posterior). Rindfleisch estimates that this second arc corresponds to the marginal edge of the proximal fibrillar masses which cross in front in a mushroom shape, although it is evident that these nuclei, well developed, are still more proximal.

That impression is not derived from our Figure 2. We rather think of the annular ridges of von Hippel, but that study on sagittal and frontal sections in the embryonic eyes of colobomatous rabbits is not possible in adult eyes with lenses markedly cataractous.

Tear of capsule. The modifications of the vascular capsule and of the mesodermal hyaloid system are the cause of that cataract and of the capsular rupture at the posterior pole (see Note 1).

That *tear* is found in both eyes of the rabbit, at the posterior pole where the lens substance is liquefied. Some connection with the retraction of the vascular and retrolental mesordermal system is plausible, without losing sight of the possibility of a rupture due to the action of the preservative fluids.

The tear of the posterior lens capsule of the right eye takes place in an area comprised between Figures 8 and 9, opposite a prolongation of the connective vascular plateau—vascular capsule—and facing the ledge or cone that forms the temporal edge of the cystic neck. We have often alluded to the mesodermal cords going from the entrance of the neck of the colobomatous cyst to the posterior lens capsule, notably Hess (1900) and Natanson (1903).

Striated muscular fibres of the hyaloid mesoderm. Fibres of this sort (direction antero-posterior) found at the bottom of this part are borrowed from the rectus muscle and have been drawn in with the mesodermal peri-vascular tissue as it penetrates behind into the foetal cleft.

Entropion of the Iris. The only observation of entropion known in 1905 was that of Enslin. In an eye affected with complete cataract the iris is increased in height and diminished in breadth. The pigmented layer stops 0·4 mm. from the pupillary edge which is bent back, its stroma stretching to the extremity of the pigmental layer: *entropion of the iris.* The stroma gives an impression of

atrophy, crypts and folds of contraction are missing; no dilatator muscle. There is an excrescence in the shape of a mass of the pigmented layer, projecting behind and originating in a marked fold of this layer towards which the cells of the iris stroma, arranged in rows, converge. The circular and symmetrical arrangement of the feature discussed are against the inflammatory origin invoked by Enslin.

Although the observation is only known to us from an abstract in Michel's *Jahresbericht*, we find a strong analogy with our *entropion of the pupil*, at the level of the coloboma, consequently a partial entropion.

An entropion of the iris was shown by Klein at the Ophthalmological Society of Vienna (1910). The iris was largely adherent to the lens. In spite of the inflammatory evidences, it is permissible to think of an injury in the course of extra-uterine (? intra-uterine) life (congenital condition, patient, aged 23 years).

Seefelder (1910) has observed an entropion of the iris; the iris was slightly folded backwards, as also was the sphincter. At the edge of the pupil the stroma passed into a tissue of the same constitution, containing vessels cut transversely (remains of capsulo-pupillary membrane). This tissue was not adherent to the lens capsule.

Seefelder believes that the pupillary membrane is not separated from the sphincter at the pupillary edge, and, consequently, is incompletely absorbed. The consequence would be a slight inversion of the pupillary edge backwards, in the course of the later weeks of development.

The pathogenesis of the iris entropion seems to us to be expressed in our Figures 4 and 5.

It is due to duplications of the iris epithelium. Following the degree of folding, the number of folds of the retinal layers of the iris, the inversion is more or less pronounced. The inversion is less marked in Figure 4 than in Figure 5. The fact is that the epithelium forms a fold, a recess round which the iris parenchyma is disposed while bending and becoming entropionized. The segments of the epithelial muscle have taken a radial direction in conformity with that of the epithelial folds. At the other part, before descending to this level, the epithelial strata and the parenchyma were normally arranged on the frontal plane. In approaching the colobomatous level the position has altered with the method of epithelial arrangement. The anomaly is equally pronounced in the associated iris segment as regards those which have been drawn (see Figure 2).

Analytical Summary

In the microphthalmic colobomatous eyes of an adult rabbit we have established the existence of a true coloboma of the optic

nerves by means of horizontal sections; an anomaly recorded in a very small number of specimens. The mesodermal cone is connected with the optic peduncle by separating its lateral walls. The nerve may be represented as the arch of a dome resting on the mesodermal sector of the hyaloid artery. The nerve is rudimentary, deprived of optic fibres, in the state of a glial web (glial plaque), and bound to folded undifferentiated retinas with heterotopic nuclei.

The distal part of the nerve alone is developed; *the proximal part is aplasic*: the retro-ocular nerve is entirely absent.

The mesodermal hyaloid mass comes forward in the form of a trapezoidal band, encircling the hyaloid vessels and the vascular capsule, which brings about the usual disturbances: lental degeneration, ruptures of the posterior lens capsule.

In one of the eyes, on account of the minimal development of the vitreous, the small space devoted to the development of the retina has pushed that structure outside; it came in contact with the invaginated mesoderm; it is evaginated, herniated. Its external expansion, at the entrance of the rudimentary optic nerve on the infero-nasal side, has caused the formation of a peri-retinal, retro-ocular envelope, a *colobomatous orbital cyst.*

Taking into account the publications made in 1911 by Terrien and Bergmeister, the author, although unable to furnish certain anatomical proofs of the participation of the sheaths of the optic nerve in the formation of the adjacent orbital cyst in one of the eyes, believes that it is very probable from the topographical point of view. If, as he thinks, the retinal leaflets are due to an ectropion with folds of the retina at the level of the posterior intrafissural mesodermal mass, there is no difficulty in admitting that the peduncular cavity and especially the optic sheaths have been laid under contribution for the formation of the cystic wall.

The development of the eye, in the absence of the proximal optic nerve, proves the considerable independence acquired by that organ after its separation from the brain in the course of its transformation into the optic cup according to the schema of Spemann.

An interesting point of the observation is the existence of four nuclear arcs in the lens, two posterior and two anterior. The author considers that there may be a direct relation between these arcs and the annular ridges described by von Hippel in the embryonic eyes of a colobomatous rabbit (interest phylogenetic). The direction of the sections and the marked lental degeneration do not permit of a definite opinion on this point.

Another particularity that merits attention is the intracystic production which follows on the glial plaque and retina which rejoins it at the entry of the cyst. While the opposite wall of the colobomatous cyst is covered by an undifferentiated retina, the wall

at the entry and the part following thereon present short and successive strata of elements where all varieties of glial cell are reproduced: astrocytes, fusiform cells with long processes and—primordial embryonic stages—elongated cylindrical, cubical, elliptical cells, all irregular. But there are some strata which assume a neoplastic appearance, and transform themselves into groups of polymorph cells, of an epithelioid aspect, to which the numerous karyokineses assign the character of undifferentiated embryonic cells suggesting a comparison with the cells so varied in form of a glandular carcinoma (in the sense of Ziegler). We are only concerned, however, with a gliosis, with a hyperplasia in no way heteroplastic, such as observed by von Hippel with less clearly defined characteristics. That multiplication has nothing in common with glioma. That gliosis will be secondary and due to the non-formation of the proper component nervous parts of the retina, nervous fibres and ganglionic cells (in part) and comparable to that which follows destruction of those elements. It is similar to the atypical proliferation of Friedländer.

The pathogenesis of the entropion of the edge of the iris, not hitherto noted, is brightly illuminated by inspection of the figures which show it; it is due to the excessive foldings of the retinal layers of the iris, to their multiple duplications which are marked towards the inferior part of the iris coloboma, foldings followed by the epithelial sphincter muscle as it radiates in the neighbourhood; this necessitates the reversal of the pupillary edge backwards.

To sum up: ***Genuine coloboma of the rudimentary optic nerves (glial plaques), aplasia of their retro-ocular segment, gliosis of the colobomatous cyst,* supernumerary nuclear arcs of the lens, entropion of the edge of the iris.***

REFERENCES

1. **Bergmeister.**—"Ein Beitrag z. Genese der Orbitalcysten und der im Mikrophtalmus vorkommenden Netzhaut und Aderhautanomalien." *Arch. f. Ophthal.*, Vol. LXXXV, p. 1, 1913.
2. **Bernheimer.**—"Ein Beitrag zur Kenntnis der Missbild. des Auges." *Arch. f. Augenheilk.*, Vol. XXVIII, 1894.
3. **Bock.**—"Die angeborenen Kolobome des Augapfels," 1893.
4. **Enslin.**—"Ueber eine bisher nicht beschriebene Missbildung der Iris-Entropion iridis." *Arch. f. Augenheilk.*, Vol. LI, p. 346, 1905.
5. **Doetsch.**—"Anatom. Untersuch. eines Falles von Mikrophthalmus congenitus bilateralis." *Arch. f. Ophthal.*, Vol. XLVIII, 1899.
6. **Duyse, van D.**—"Aplasie du nerf optique et colobome maculaire." *Arch. d'Ophthal.*, Vol. XIX., 1899.
7. **Idem.**—"Pathogénie de la cyclopie." *Arch. d'Ophtal.*, 1898.
8. **Idem.**—"Encyclopédie d'Ophtalm." Vol. II, p. 490, Foetus, Vol. XII, 1905.
9. **Ginsberg.**—"Ueber embryonale Keimverlagerung in Retina und Centralnervensystems, ein Beitrag z. Kenntnis des Netzhautglioms." *Arch. f. Ophthal.*, Vol. XLVIII, p. 92, 1899.
10. **Helfreich.**—"Beitrag zur Lehre von Glioma retinae." *Arch. f. Ophthal.*, Vol. XXI, Part ii, p. 236, 1875.

*For the intrapeduncular part.

11. **Hippel, von.**—"Ist das Zusammenkommen von Mikrophthalmus congenitus und Glioma retinae im gleichem Auge sicher erwiesen?" *Arch. f. Ophthal.*, Vol. LXI, p. 352, 1905.
12. **Klein.**—"Inversio iridis." *Wiener Ophth. Gesellsch.*, 16 November, 1910. *Zeitschr. f. Augenheilk.*, Vol. XXIII, p. 280, 1910.
13. **Mannhardt.**—"Das Colobom der Aderhaut und seine Folgen." *Arch. f. Ophthal.*, Vol. XLIII, p. 127, 1897.
14. **Natanson.**—"Ueber Micropthalmus und Anopthalmus congenitus mit serösen Orbito-palpebralcysten." *Arch. f. Ophthal.*, Vol. LXVII, p. 185, 1908.
15. **Rindfleisch.**—"Beit. z. Entwicklungsgesch. der angeb. Missbildungen des Auges." *Arch. f. Ophthal.*, Vol. XXXVII, Part iii, p. 192, 1891.
16. **Seefelder.**—"Entropium des Pupillarrandes." *Ergebn. der allgem. Pathol., etc.*, p. 747, 1910.
17. **Spemann in Schwalbe.**—"Die Morpholog. und die Missbild. des Menschen und der Thiere," Vol. III, f. ii, 1913.
18. **Terrien.**—"Kyste rétro-oculaire et pseudo-microphtalmie." *Arch. d'Ophthalm.*, Vol. XXXI, p. 787, 1911.

INJURIES TO THE TROCHLEA

BY

A. S. PERCIVAL, M.A., M.B. Cantab.,

SENIOR SURGEON EYE INFIRMARY, NEWCASTLE-UPON-TYNE.

ON several occasions the trochlea of the superior oblique has, unfortunately, suffered during surgical operations in its neighbourhood; but, as far as I know, no case but one of my own has hitherto been reported of accidental damage to the trochlea. I have just seen a second case, and I think that if attention were directed towards its possibility, it would be found to be not so unusual as imagined.

My first case was reported in the *Northumberland and Durham Medical Journal*, 1898, in a paper on the Diagnosis of Ocular Paralyses.

The patient was a lady who, in 1895, had received an accidental injury to her right eye from the point of a walking stick. A small scar was seen over the site of the trochlea, and she had all the symptoms of right superior oblique paralysis except the tilting of the false image. Thus, she had homonymous diplopia on looking downwards, with considerable depression of the false image on looking downwards and to the left. I considered that the fibro-cartilaginous pulley had been torn from its situation and had reattached itself further back. In this way intorsion of the eye might only result when the muscle acted, so that there would be no tilting of the false image. I saw the lady only a year ago with her husband, who had caused the injury, and found that the curious prismatic combination I had ordered her twenty years ago was still quite satisfactory.

Last week (May 31, 1919) I saw a boy at the Eye Infirmary who

told me that four months ago he had fallen against a hook on a wall which had caught the lower part of his left eye. On the lower and inner part of the globe was a raised red patch close to the fornix. He had no pain, and his sight in that eye was excellent, but he had all the signs of left superior oblique paralysis which dated from the accident. There was neither any history nor any sign of injury about the upper and inner part of his orbit, but the site of the trochlea was distinctly tender to pressure.

I presume that the blow pressing the eye forcibly upwards and outwards put such a strain on the pulley that it tore.

As the diplopia did not seem to inconvenience him much except when he was reading, I advised him when looking down to turn his head downwards and to the right, i.e., turning his head in the same direction as the affected muscle, if it acted, would turn his eye. He seemed to be quite satisfied with this as he could then read comfortably. I told him, if it made him tired, to wear a shade over one or the other eye.

Now, if a patient were not so easily satisfied, it is an interesting point to consider what should be done for him. It would be possible to detach a strip of periosteum from below and make a new pulley by attaching it to the adjoining periosteum, but it might not be strong enough. Prof. Morison, whom I consulted about this problem, suggested adding a little strip of fascia lata. I should be glad to hear of any other suggestions for the purpose, but I am afraid that, at any rate in my hands, the result would not be satisfactory to me, although some benefit might be derived.

Since writing the above I have seen, at the Eye Infirmary, another case of trochlear injury. A boy had been kicked by a horse on the right superciliary ridge; little damage resulted except for the complete detachment of his right trochlea, and the consequent inaction of his superior oblique.

MOBILE CYST OF THE IRIS

BY

EDGAR STEVENSON,

CAPTAIN R.A.M.C.

THE following account of a curious eye condition is put forward in the hope that it may be of interest, though I am fully aware that a mere description of such a case is generally unconvincing. Unfortunately, however, owing to the patient's age and state of health, it is impossible to present her at any scientific meeting away from Liverpool.

A few days ago my friend, Dr. Heaney of this city, asked me to see an old lady who, he said, was able at will to pour a brown fluid from the posterior chamber of her right eye into the anterior chamber, and then let it flow back again. This sounded rather like a conjuring trick, but when I came to examine the patient, I found that his description was almost literally accurate.

The patient, aged 67 years, is rather frail looking, but with no organic disease, and her statement, corroborated by her daughter, is that this "appearance" first took place quite suddenly, and without any pain about ten years ago. It has persisted ever since, and has been a sort of a joke in the family, but latterly it seemed to be getting larger, and she thinks it is beginning to affect her sight. It also annoys her. She is conscious when it takes place, and when it happens, as it often does, in a tram-car, she thinks people will notice it. About four years ago she had an operation for gall stones. "It" then disappeared altogether for about six months, and returned quite suddenly one morning while she was having breakfast.

When the eyes are examined in strong daylight, the only abnormality noticed is that in the iris of the right eye (both irides being a light greyish blue) there is an area of discolouration about 3 mm. wide and with sharply defined edges extending vertically downwards from the central pupillary margin to the base of the iris, and lying in this latter position behind the iris is a small dark patch, wider than the discoloured area, and looking rather like a hyphaema in the wrong place. The "area of discolouration" gives the impression as if the bluish tint had been washed out of the iris, and on closer inspection looks like a patch of atrophic thinning. The pupils are equal, of about normal size, and act normally; the tension of both eyes is equal and apparently normal. She is slightly hypermetropic, and vision with correction = 6/9 in each eye. There are a few striae in each lens: no sign of any other pathological change.

The above is all that is observable as long as she keeps her head up, but when she bends her head there is a very remarkable change. A greyish brown body with minute blood-vessels on the surface has appeared in the front of the iris, extending downwards nearly to the base of the anterior chamber, and of the same width as and lying on the "discoloured area" already described.

This greyish brown body is rather like heavy lubricating oil pouring over the edge of a cup, but with this peculiarity, that as soon as she raises her head this viscous looking "fluid" gradually rises and slips back over the edges of the iris, and can be seen slowly settling down and resolving itself into the dark substance at the base of the posterior chamber.

It is difficult to describe adequately this most peculiar and striking phenomenon, which can be repeated apparently indefinitely, and

without any discomfort to the patient, except for the bending of her head, the time taken being a few seconds for the appearance and for the disappearance rather longer.

It is also difficult for me to discuss the case, as I have not previously seen, or heard of, a similar one, but as regards the dimness of sight, of which she mainly complains, I am inclined to think that this is due to the heaping up of the "fluid" as it passes over the concave edge of the iris, and this would naturally be more pronounced when the pupil is contracted in a strong light, and in any case her pupils are naturally getting smaller as she gets older. As regards the aetiology of the condition, I can only suppose that this is a form of the rare kind of cyst described by J. Herbert Parsons as being formed between the retinal layers of the iris, but he does not mention that any of these cysts have the peculiar faculty of appearing in the anterior chamber.

ACUTE ANTERIOR ETHMOIDITIS IN YOUNG SUBJECTS

BY

P. A. HARRY, M.D.

OPHTHALMIC SURGEON TO THE ROCHDALE INFIRMARY

IN reference to the paper by Mr. Sydney Stephenson on acute anterior ethmoiditis in the August number of the BRITISH JOURNAL OF OPHTHALMOLOGY I may say that I have seen cases such as he describes in children of from 4 to 12 years, but the one I am about to relate is of special interest owing to the age of the patient, namely, 3 weeks:

Ernest P. was sent to the Rochdale Infirmary by Dr. S. B. Brentnall on July 9, 1918. The history was that the left eye had been slightly inflamed since birth. The appearances were those of "a cold in the eye." The condition was treated as an instance of ophthalmia neonatorum for the first ten days.

When I first saw the infant the conditions were as follows: L.E., considerable proptosis and great resistance to pressure backwards. The eye projected directly forwards. Slight inflammation of the conjunctiva accompanied with little discharge. There was a considerable amount of discharge of blood-stained material from the left nostril. The pupillary reactions and the fundus of the left eye were normal. Transillumination through the mouth yielded negative results. A similar remark applies to examination of the nose with Holmes's pharyngoscope. The child was peevish and restless, but there was no rise in temperature and no diarrhoea.

With regard to treatment gentle curetting of the anterior ethmoidal area through the nose was followed by an escape of pus. Hydrogen peroxide was instilled often into the left nostril. Fomentations were applied to the left eye.

On July 11 the proptosis was much reduced. On July 16 the proptosis had disappeared. There was no abnormal orbital resistance. The fundus was normal. Discharge from the left nostril was still copious. On August 8, the child was discharged as cured.

COUNCIL OF BRITISH OPHTHALMOLOGISTS

Report on the desirability of a special qualification in ophthalmology

THIS report is divided into five parts:

I.—The existing conditions concerning examinations in special subjects.

II.—Examinations in Ophthalmology in the United Kingdom.

III.—The qualifications required by the principal hospitals of the United Kingdom for appointment to the post of Ophthalmic Surgeon.

IV.—The desirability of a special examination in Ophthalmology.

V.—Conclusions and recommendations.

I.—The existing conditions concerning examinations in special subjects

At present there are in the United Kingdom special examinations in Dental Surgery, Public Health, Tropical Medicine and Ophthalmology.

These examinations may be classified in two groups:

(a) Those in which the special subjects form part of a higher examination in medicine or surgery, e.g., Tropical Medicine; State Medicine; Ophthalmic Surgery; Aural, Nasal and Laryngeal Surgery; and Dental Surgery for the M.D. or M.S. of the University of London: Ophthalmology; Aural, Nasal and Laryngeal Surgery; Advanced Midwifery with Obstetric Surgery and Gynaecology; Advanced Anatomy; and Dental Surgery for the Fellowship of the Royal College of Surgeons, Edinburgh.

(b) Those in which qualified medical men are examined in a special subject, independently of any examination in general medicine or surgery, e.g., for the Diploma in Public Health, University of Cambridge; the Licence in Dental Surgery, Royal College of Surgeons, England; and the Diploma in Ophthalmology, University of Oxford.

II.—Examinations in Ophthalmology in the United Kingdom

The first examination in Ophthalmology as a special subject was established by the Royal College of Surgeons of Edinburgh, in 1883. In the examination for the Fellowship, Ophthalmology is included in the list of special subjects, of which one must be taken. The diploma granted bears no indication of the special subject in which the candidate was examined.

At the University of London, Ophthalmology has recently been recognised as a special branch of the M.S. degree under the following conditions :—

Every candidate for the degree of Master of Surgery must have taken the degree of Bachelor of Medicine and Bachelor of Surgery in this University not less than two years previously, except as provided below.

Candidates who have either (I) the M.B., B.S. degrees with Honours in Surgery; or (II) subsequently to taking the M.B., B.S. degrees, conducted a piece of original work approved by the University, or (III) subsequently to taking the M.B., B.S. degrees had such exceptional experience as may be approved for this purpose by the University, may present themselves after an interval of one year only from the time of taking the M.B., B.S. degrees provided that they comply in other respects with the conditions stated in the following paragraphs :

Certificates.—Every candidate must forward together with his form of entry the following certificates :—

1. A certificate of having spent at least two years in the study and practice of ophthalmology at a teaching school or schools approved by the University, of which one year at least must have been subsequent to obtaining the M.B., B.S. degrees in this University.

2. A certificate of having held during this time for at least six months an approved appointment in the ophthalmic department of a general hospital recognised by the University for the purpose, or at an ophthalmic hospital recognized by the University.

Details of examination.—The examination will consist of :—

Two papers in ophthalmology (in one of which there may be included a case for commentary.)

One paper in the principles of surgery.

A clinical examination.

One paper in the anatomy and physiology of the eye and other parts concerned in ophthalmology (including physiological optics).

One paper in the pathology of the eye and other parts concerned in ophthalmology.

An oral examination.

Candidates shall not be approved by the examiners unless they have shown a competent knowledge in all the subjects of the examination.

At the University of Oxford a diploma in ophthalmology (D.O.,Oxon), was instituted in 1910. It is granted under the following conditions :—

Candidates must have their names on the medical register of the United Kingdom, unless, being Bachelors of Medicine or Doctors of Medicine of universities outside the United Kingdom, they have obtained special permission from the Board of the Faculty of Medicine.

Candidates shall be required, at the times of entering their names, to produce the following certificates :—

A certificate or certificates showing that the candidate has duly attended a course of clinical ophthalmology for twelve calendar months in connection with hospitals or institutions recognised for the purpose by the Board of the Faculty of Medicine.

A certificate showing that the candidate has satisfactorily carried out in the University of Oxford the practical study of the anatomy of the eye and its appendages, including the development and minute structure of these parts.

A certificate showing that the candidate has satisfactorily carried out in the University of Oxford the practical study of physiological optics and the physiology of vision.

A certificate showing that the candidate has duly attended a course of ophthalmology in the University of Oxford for a period of at least two months.

The subjects of the examination are dioptrics, diseases of the eye, ophthalmology in general medicine, clinical cases and ophthalmic surgery.

In the University of Liverpool a diploma in ophthalmology was instituted, but is not now granted.

Examinations in Ophthalmology in America

University of Colorado.

Degree of Doctor of Ophthalmology inaugurated in 1913.

Requirements for the Degree. The degree of Doctor of Ophthalmology will be granted to those meeting the following requirements:—

A. Evidence of graduation at a standard medical school, and of a preliminary education covering high school algebra, geometry, plane trigonometry, and elementary optics.

B. One year of clinical work of 300 days, two hours per day:—

1. By service as interne in a hospital for diseases of the eye:

2. By service as clinical assistant in an approved out-patient department for the treatment of eye diseases:

3. By regular attendance in a school for post-graduate medical teaching, where the students are given sufficient facilities for the actual examination and treatment of patients:

4. By serving as assistant to an ophthalmologist in private practice, who is recognised as a competent teacher of clinical ophthalmology:

5. Or by a combination of the above:

C. One or more summer courses in ophthalmology at the University of Colorado.

D. Each Candidate must pass an examination, written, oral, microscopical, and clinical; and must submit an original thesis, and stand an examination thereon.

The course is planned to fill the time of two scholastic years and consists of optics, histology, pathology, ophthalmology, and operative surgery.

University of Minnesota.

Doctor of Ophthalmology. In this University a course similar to that in the University of Colorado has been instituted, but all the work is expected to be done in the University.

III —The qualifications required by the principal hospitals of the United Kingdom of candidates for the post of ophthalmic surgeon

A circular letter was sent to all the principal hospitals in the United Kingdom asking what professional qualifications were required of candidates for the post of ophthalmic surgeon.

Replies were obtained showing that 17 required the Fellowship of the Royal College of Surgeons, England; 5 the Fellowship of the Royal College of Surgeons, Edinburgh; 4 the Fellowship of the Royal College of Surgeons, Ireland; 2 the degree of Master of Surgery of a University or the Fellowship of the Royal College of

Surgeons, England; 8 a medical degree of a University or the Fellowship of one of the Royal Colleges of Surgeons of the United Kingdom. (Three of the last group will accept the Membership of the Royal College of Surgeons of England.) Eighteen do not require any special qualification.

The following five hospitals require evidence of special training in ophthalmology:—Belfast Ophthalmic Hospital, two years; Central London Ophthalmic Hospital, two years; Royal Westminster Ophthalmic Hospital, two years; Western Ophthalmic Hospital, two years; Liverpool Eye and Ear Hospital, six months.

Under present conditions the degrees or diplomas which candidates for the posts of ophthalmic surgeon to the principal hospitals in the United Kingdom must hold, while they testify to proficiency in general medicine and surgery, furnish no evidence of special knowledge of ophthalmology.

IV.—The desirability of a special examination in ophthalmology

In the higher surgical examinations as at present conducted there is seldom any adequate test of a candidate's knowledge of ophthalmology. The examiners are general surgeons who are not thoroughly conversant with the subject, and there is, therefore, a natural tendency on the part of the student to devote insufficient attention to this branch of surgery. Formerly the examining boards included a proportion of surgeons who practised as ophthalmologists, and in consequence the subject was more frequently and adequately dealt with.

The importance of ophthalmic knowledge and experience in relation to the welfare of the population is now widely recognized. The large and increasing number of appointments for which such knowledge and experience are required renders it essential that candidates for these posts should be able to show, not only that they have gone through a satisfactory course of training in ophthalmology, but that they have attained a certain standard of proficiency, as tested by examination.

The practice of ophthalmology must be based upon an accurate knowledge of the anatomy and physiology of the visual organs, optics, and the pathology of the eye. The establishment of a special examination in ophthalmology would ensure that candidates have been adequately trained in and possess a sufficient knowledge of these subjects. It would at the same time be an incentive to the special hospitals to provide increased facilities for instruction.

The close relationship of ophthalmic to general surgery renders it imperative that those who propose to practise as ophthalmic surgeons should possess a sound knowledge of the general principles of surgery, pathology, bacteriology, etc., and of their application to the surgery of the eye, orbit, and surrounding structures. The

Council therefore hold that an examination in ophthalmology should form part of the examination for a higher degree or diploma in surgery, as is now the case at the University of London and the Royal College of Surgeons, Edinburgh, rather than that there should be a special examination in ophthalmology alone.

If such an examination is adopted it is desirable that it should be definitely stated that the degree or diploma is granted in ophthalmology.

The Council are of opinion that every candidate before presenting himself for examination should be required to produce evidence that he has studied ophthalmology during a period of two years, of which one has been spent in holding recognized ophthalmic appointments.

V.—Conclusions and Recommendations

(1) It is desirable that the universities and colleges in the United Kingdom should make provision for a special examination in ophthalmology for those who propose to devote themselves to this branch of medicine.

(2) It is desirable that ophthalmology should be one of the optional subjects in which a candidate can elect to be examined for the degree of Master of Surgery of a University, or for the diploma of Fellow of a Royal College of Surgeons, as is at present the case at the University of London and the Royal College of Surgeons, Edinburgh.

(3) Before presenting himself for such an examination the candidate should furnish evidence of at least two years' study of ophthalmology, one of which has been spent in holding recognized ophthalmic appointments.

(4) The special examination in ophthalmology should be written, oral, and practical, and should comprise the following subjects: anatomy, pathology, optics, systematic and clinical ophthalmology, and operative surgery.

ANNOTATIONS

Illuminating Engineering Society

A recent number of the *Illuminating Engineer*, the official journal of the Illuminating Engineering Society, gives a summary of the papers read before the Society since its foundation in 1909. The record is a very satisfactory one. During the war, committees of the Society did most useful work, some of which we have referred to in a previous number (p. 207, 1919). The more intimate relation

between the scientific and the business world, which is one of the objects of such societies, is of great value; in the past the tendency has been too much towards work in separate and unconnected compartments. The Society has decided to divide the membership into two classes designated respectively "members" and "associates," the former being those who are professionally connected with lighting, and the latter those who are incidentally interested in one or other special aspects of illumination. The annual subscription for the former is to be two guineas and for the latter, which includes students, one guinea.

Joint committees on railway lighting, street lighting, school lighting, etc., have been formed. A special joint committee on eye-strain in cinema theatres and its prevention has been formed in which the Council of British Ophthalmologists is represented by Messrs. J. H. Parsons, C.B.E. (chairman), Mayou, McMullen, O.B.E., and Cridland, and the Physiological Society by Professors Bayliss, Shearman, Sherrington, and MacDougal. The Illuminating Engineering Society, the Cinema Industry, the Fire Brigade, and the Education Department of the London County Council are also worthily represented. We confidently look forward to valuable results in this connection.

Injuries to the Eye by Poison Gas

Little has been published in English upon injuries to the eye by poison gas*, although many such cases have been seen in this country by individual observers. It is therefore with all the more pleasure that we welcome a discussion of the subject held at the last meeting of the American Ophthalmological Society. Dr. H. G. S. Derby, late assistant consultant in ophthalmology to the American Expeditionary Forces, pointed out that the so-called *lacrimatory gas* was only one of the varieties of gas used by the Germans for the purposes of disabling their enemies. It caused burning pain, copious lacrimation, photophobia, and injection of the conjunctiva. Exfoliation of the epithelial covering of the cornea was liable to follow exposure to the fumes. The milder cases recovered quickly. Even those of a more severe nature were usually well within two weeks. Injuries from *mustard gas* were much more serious. Its action was not noticed until from two to six hours after exposure to the fumes, when severe erythema of the skin developed, followed by blistering, the moist parts of the body being most severely affected. In severe cases bronchitis and secondary pneumonia were observed. There was profuse lacrimation and considerable

* Two papers dealing with gas injuries to the eyes have been recently published in this journal, namely: J. A. Pringle, March, 1919; Wallace, November, 1919.

injection of the conjunctiva. Mild cases formed 75 per cent. to 80 per cent. of those affected. In the remainder the lids showed redness and swelling, and often the formation of bullae. All attempts to open the lids gave rise to pain. The conjunctiva was markedly injected and might be in a state of chemosis. In severely burned eyes there was often an area of solid white oedema of the conjunctiva in the palpebral fissure. The corneal lesions varied in severity, but principally consisted of a roughening of the epithelium with irregular, greyish scattered areas of opacity. The most severe cases showed a whitish band crossing the cornea in the area of the palpebral fissure. The lesions produced by mustard gas are in the nature of a chemical burn. In mild cases recovery may take place in from one to two weeks, and the others may last from four weeks to four months. A neurotic condition, hard to overcome, may be set up by the injury to the eye. Prevention calls for the gas mask. Cure is retarded by bandaging the injured eye. Exposed eyes should be washed out often with sodium carbonate or boric acid solution. A drop of some oil, such as liquid albolene, should be instilled. When much blepharospasm and irritation are present, atropin should be used. A shade or dark glasses should be worn. Protargol, argyrol, weak zinc sulphate, all may have their places in the treatment of the condition. Dr. F. H. Verhoeff, who had seen a number of these cases after their return to America, believed that the badly exposed men would have more or less trouble with their eyes all their lives. Dr. Allen Greenwood, late senior consultant in ophthalmology to the American Expeditionary Forces, emphasized the necessity of early treatment, the avoidance of bandages and the hospitalization of the patients. Dr. Nelson M. Black, late consultant in ophthalmology to the American Expeditionary Forces, recommended that when the patient felt that he must protect his eyes in some way from the light, he should make eye shades from the blue paper that was wrapped around packets of absorbent cotton wool.

ABSTRACTS

I.—REMEDIES

(1) **Sculco, Nicolas (Catanzaro, Italy). The new therapeusis of trachoma. (La nouvelle thérapeutique du trachome.)** *La Clin. Ophtal.*, February, 1919.

(1) However pessimistic one may have become as to the value of new remedies for rebellious diseases, it is always right that the

medical profession should have the details thereof in order that whatever is new should be tested out. With such an object in view the reviewer will endeavour by means of an abridged translation to make clear the method discovered by **Sculco** and presented to the Royal Medico-Chirurgical Academy of Naples on 25 June, 1916.

The active principle of the medicament is a chemical ferment extracted from *Nepeta citriodora* which has a definite parasitotropic action on the infective agent of trachoma. This ferment, in association with resinous substances and glucosides of two other plants, namely, *Thimus serpillium* and *Salvia officinalis* is dosed out and diluted in an indifferent vegetable powder and put up in little paraffined glass tubes, each of which represents a dose for one treatment (*pansement*). The ferment, which is liable to alteration under the influence of light and damp, has neither caustic nor toxic action and produces no reaction on the healthy conjunctiva. It has no action on other conjunctival inflammations. If there are other forms of conjunctival derangement associated with the trachoma, it cures the latter without influencing the former. The ferment acts most powerfully and rapidly in the period of lymphoid hyperplasia of the tarsal and palpebral conjunctiva with or without pannus and ulceration. In the early stage of trachoma its action is quite limited. The author expresses this by saying that it acts in the *phase of maturity of trachoma*. The ferment has no action in advanced cicatricial degeneration, but is nevertheless of great use applied as an ointment in the so-called atrophic pannus. Whereas other methods have as their object the destruction of the diseased conjunctiva, this remedy spares the tissues and acts directly on the cause. The other methods may require a lifetime: this remedy accomplishes its task in about forty days.

It seems advisable to give the technique of application mainly in the author's exact words.

(1) With a sterile needle or sound the powder which is sticking to the walls of the little tube is to be detached, and then dredged over the conjunctiva, the lids being everted. The lids are carefully closed and the eye bandaged for about two hours. Sharp smarting lasts for about twenty minutes.

(2) On the second and third days the tubes in the box marked 2 and 3 are to be used and on the following days any one of the remaining tubes.

(3) The treatments should be consecutive and in the aforesaid order. On the third or fourth day, with the fingers or with Knapp's forceps, the exuberant granulations of the tarsal conjunctiva, retrotarsal folds, culs-de-sac and caruncle (if infiltrated) are to be "expressed": and then, when the bleeding has ceased, the remedy is to be applied.

(4) The aforesaid time—presumably the two hours or so

mentioned under (1)—having elapsed, the conjunctiva and fornix are to be well washed out with warm sterile water, so that nothing remains of the medicament. The chemosis and conjunctival oedema, which are often well marked, disappear in two hours. Secretion is abundant after the first and second treatments and is always directly related to the intensity of the trachoma. In severe cases it may continue even to the tenth treatment, though ordinarily at the fifth it is greatly diminished or has almost ceased.

(5) The number of applications varies according to the case. The physician must be guided by the abatement of signs and symptoms, and in any case a few extra treatments do no harm. The treatment should be suspended only when the granules have disappeared, and when the tarsus is reduced to normal proportions. One should pay no attention to the conjunctival roughnesses which appear during the first days. These are an expression of the reaction of the tarsal conjunctiva to the infective agent. So soon as the latter disappears the former will disappear also.

(6) In cases of trachoma which commence with small deep granules, and in those characterized by small papillae on the tarsal conjunctiva, it is necessary, if one wishes the best result, first of all (before application of the remedy), to scarify with a discission needle the conjunctiva over the granules, so that the medicament may penetrate as deeply as possible into the subconjunctival tissue and the tarsus.

(7) If pannus is accompanied by ulceration, it is necessary to wash out all the powder carefully from the base of the ulcers, since it may cause irritation if left there. In this way the ulcer very soon becomes clean, and goes on to cicatrisation. Atropin and dionin are very useful, employed after the lavage.

(8) One eye should be treated at a time.

(9) The patient should remain under observation for six months in case of relapse.

The Editor of *La Clinique Ophtalmologique* prints a note in heavy type referring to Sculco's method. It is there stated that samples will be sent free to oculists who ask for them, and that the ordinary price for each box, containing ten treatments, is 22 francs.

ERNEST THOMSON.

(2) **Gaupillat (Montargis).—Various eye diseases treated by cow's milk. (Diverses maladies des yeux traitées par le lait de vache).** *La Clin. Ophtal.*, February, 1919.

(2) **Gaupillat** gives the case histories of seven individuals whom he has treated by Domec's method of intramuscular injection of cow's milk. Traumatic keratitis (2 cases) was rapidly influenced. The same remark applies to corneal infection, the

result of a foreign body. In a case of serous iritis, cure was obtained more easily and quickly than by classical methods. There was no result in a case of herpes febrilis corneae. An eye threatened with destruction from infection by a foreign body was saved from enucleation. In a case of parenchymatous keratitis, the origin of which the author is unable to state, *subconjunctival* injections of milk acted better than the usual remedies.

ERNEST THOMSON.

(3) **Darier, A. (Paris).—Parenteral injections of cow's milk. (Des injections parentérales de lait de vache.)** *La Clin. Ophtal.*, March, 1919.

(3) In this article **Darier** is mainly engaged in a comparison between the method of milk injection introduced by Müller and Thanner, of Vienna, in 1916, and the method of para-specific serum therapy. He concludes that milk injections constitute one of the most energetic stimulants of the general defensive system of the organism. They activate leucocyte formation (*leucopoïèse*) and phagocytosis and also cause an evanescent febrile condition. Combined with serumtherapy by the mouth such injections are one of the most certain means of combating very various infections, and especially infective ulcers of the cornea, iritis, and traumatic or post-operative infections. Opinion is divided as to their value in parenchymatous keratitis and granular conjunctivitis. In influenzal infections, broncho-pneumonia, and so on; in gonorrhoeal complications, rheumatism, etc., the combination of milk and serum treatments is most useful.

ERNEST THOMSON.

(4) **Dianoux (Paris).—Aspirin in syphilitic iritis. (Iritis syphilitique et aspirine.)** *La Clin. Ophtal.*, March, 1919.

(4) The case reported by **Dianoux**, is very interesting. He says: "Mlle. F. came to me on January 17 complaining of pain of several days duration in the left eye. The sight of the eye was much reduced. I found an acute iritis with multiple synechiae, little lacrimation, not much pain as in the general run of cases of this kind. Quite recently there had been mucous patches in the throat. There had been no treatment. I prescribed a collyrium of atropin, and three grammes of aspirin to be taken in one dose, in syrup, at bed time. On the 20th all infection had disappeared and there remained only one synechia."

The patient was then sent by Dianoux to a specialist for general treatment.

Dianoux throws out the hint that aspirin may be an antisyphilitic drug and suggests that the subject is worthy of investigation.

ERNEST THOMSON.

(5) **Darier, A. (Paris).—*Vaccines in ocular therapeutics.*** (**Des vaccine en thérapeutique oculaire.**) *La Clin. Ophtal.* April, 1919.

(5) The reviewer proposes to transcribe the introductory statements given by **Darier** in this article, leaving the details to be studied in the original.

" . . . First of all let it be said that for a good application of vaccine therapy:—

(1) The technique should be simple and at the service of every practitioner (hypodermic injection). Absorption by the mouth, while good for paraspecific serumtherapy, has, up till now, been insufficiently studied for vaccines.

(2) The vaccine must be harmless. Vaccination with living bacilli, even when attenuated, requires to be accepted with the utmost reserve; it is better far to make use of bacilli which have been "well and duly" killed. It is well known that the dead bodies of bacilli can bring about the appearance of specific antibodies.

(3) The dosage should be exact, either by giving the weight of the dry substance, or, better still, by emulsifying the bacilli to the number of so many millions per cubic centimetre.

(4) A vaccine should not be liable to alteration. To that end a vehicle is used which contains 0·5 per cent. of phenol, lysol, etc.

(5) The result of the vaccination should be immunity for several months.

(6) Active immunisation ought not to be the only method of prevention. It makes things more certain to add every known efficacious means and all possible hygienic precautions.

But in every process, whether of infection or of immunisation, the personal factor of individual resistance plays a part which the practitioner must not lose sight of."

The reviewer is no bacteriologist, and is unable to appraise the value of the following statement, which, however, strikes him as extremely plausible:—

"To an organism which is unable to destroy the microbes which have invaded it are furnished, by means of inoculation of vaccines, the same microbes in a form easy to destroy. Thanks to this easier attack, the organism becomes trained for battle. It fabricates antibodies which then assist in the phagocytosis of the microbes of the disease."

ERNEST THOMSON.

(6) **de Lapersonne and Degrais, Paris. The treatment of tumours of eyelids by radium. (Le traitement des tumeurs des paupières par radium.)** *Arch. d'Ophtal.*, May-June, 1919.

(6) In this article the authors direct special attention to the necessity for precision in dosage in the use of radium. Radium therapy, like X-ray therapy, has passed through a period of empiricism, and dosage can now be determined almost as accurately as that of ordinary drugs.

It is now possible to indicate (1) the quantity of radium to be employed, (2) the use or non-use of a filter to regulate the depth to which the rays will penetrate, (3) the duration of the application. Three cases are reported as examples. In all the results of radium treatment were wholly satisfactory. One case was that of angioma of the eyelid of a little child, large enough to cover the eye and surrounding structures, it was treated by seven series of applications at intervals of six to ten weeks. The other two cases, occurring in elderly women, are termed epithelioma; they appear to be what is commonly known as rodent ulcer in this country. All three cases are illustrated by "before-and-after" photographs.

J. B. LAWFORD.

(7) **Chevalier (Mans).—A contribution to the study of collargol in its ocular applications. (Contribution à l'étude du collargol dans ses applications oculaires.)** *La Clin. Ophtal.* May, 1919.

(7) The article by **Chevalier** is partly personal experience and partly a review of the experience of others regarding collargol as applied to the treatment of eye conditions. While not, apparently, containing much new matter it certainly forms a very useful summary of the administration and dosage, the technique of preparation, the therapeutic indications and the mode of action of a drug which is already fairly well known to ophthalmic surgeons.

ERNEST THOMSON.

(8) **Arruga (Barcelona).—Treatment of sympathetic ophthalmia by salvarsan and its derivatives. (Tratamiento de la oftalmia simpatica por Salvarsan y derivados.)** *España Oftalmologica*, August, 1919.

(8) Salvarsan as a therapeutic agent in the treatment of sympathetic ophthalmia in Spain was first used in Barcelona by Professor Jadassohn in 1910. The present paper, by **Arruga**, deals with seven cases dating from 1914 onwards. The author's results seem to have been most satisfactory; his conclusions are as follows.—The action of salvarsan as a therapeutic agent in sympathetic ophthalmia is extremely favourable in the vast majority of cases. Its action is all the more brilliant the further advanced the lesion, and in the gravest cases its action is

most marked. It is necessary to have the diagnosis confirmed to be sure of one's results, viz., the exciting eye after removal should show the typical histological appearances of an exciting eye, and the Wassermann reaction must be negative.

The aggravation of symptoms which occasionally occurs in the first few days following the injections is always followed by manifest improvement.

This new therapy has made the prognosis of sympathetic ophthalmia much less grave than heretofore.

A good bibliography accompanies the paper, but no references to the blood count are given. R. R. JAMES.

II.—THE OCULAR CONDITIONS OF THE AVIATOR

(1) **Wilmer, Col. William H. (Washington D. C.)—Some ocular conditions affecting the efficiency of the aviator.** *Trans. Amer. Ophthal. Society*, 1918, p. 131.

(1) The medical problems that affect the aviator are unique, owing to the time he is compelled to spend under unaccustomed surroundings. For example, he must school himself to sudden changes of temperature and of barometric pressure, to the changes from ground to "labile equilibrium," and, most important of all, from normal sea-level oxygen tension to a much decreased oxygen tension. **Wilmer** has produced artificially the conditions of a lowered oxygen tension by two different forms of apparatus: (1) by a large low pressure chamber from which the air is removed by a pump, the barometric pressure being at the same time lowered, while the amount of CO_2 increase in the chamber is neglible, owing to good ventilation. (2) By the Henderson re-breathing apparatus, where the subject breathes up his own oxygen from a tank, the excess of carbon dioxide being absorbed by sodium hydroxide. That the physiological changes noted in flying are due to lack of oxygen and not to the reduced atmospheric pressure is shown by the facts that the tests made by these two forms of apparatus agree closely and that the administration of oxygen causes a quick return of the disturbed functions to the normal. In testing the acuteness of sight under low oxygen conditions Wilmer has not found any *very marked* change. In hypermetropic subjects, however, there is likely to be a deterioration, owing to reduction in power of the ciliary muscle, while in the slightly myopic there is a tendency to improvement for a similar reason. Experience has not substantiated the claim made in some quarters that vision is improved in the air at the height of about 200 meters, owing to a congestion of the head, choroid, and retina. In the

course of his experiments Wilmer has found little practical change in colour vision, although there has been some alteration as regards the threshold values. As to the fields of vision it has been found that the periphery of the retina is more responsive to lack of oxygen than the macular region. In the average there has been no great change, but in some cases up to 10,000 feet the visual fields seem to increase; at about 15,000 feet there is a slight contraction; at 20,000 feet there is a marked contraction for form and colour. The test for threshold retinal sensitivity takes up too much time to be useful as a quick clinical test, and so Wilmer has replaced it by a comparative sensibility test. The object is a grey letter on a lighter grey background, there being thirteen shades of difference perceptible between them. Reeve's wedge (a layer of gelatine of increasing density of colour contained between two pieces of optical glass) is passed before each eye separately until the grey letter can no longer be recognised, and the result is registered by a scale attached to the appliance. Stereoscopic vision does not suffer any serious impairment in oxygen deprivation. The grave ocular disturbances in the eyes produced by the peculiar environment of the airman take place in the intrinsic and extrinsic muscular apparatus. There is often a falling off in the power of accommodation, convergence, and in the field of binocular fixation, to illustrate which points several diagrams are appended to Wilmer's communication. With the failure of accommodation it becomes impossible for the airman to read the figures of the instruments in the fuselage, while failure of convergence spells double, confused, dangerous vision. It is of some interest to note that smoking has been found experimentally to have a detrimental effect upon the ocular functions of aviators.

Although the eye is but one of the peripheral sense organs concerned in the function of equilibrium, yet it is second to none in importance, and Wilmer has become more and more impressed with the vast importance of selecting candidates for aviation who possess sound eyes and well-balanced muscles and good adduction, and who are practically free from hyperphoria, and, as he points out, the proper classification of the man is also of equal importance.

S. S.

(2) **Doesschate, Dr. G. ten. (Utrecht).—On defects of the visual field in flying officers.** (**Ueber Gesichtsfeldstörungen bei Fliegeroffizieren.**) *Zeitschr. f. Augenheilk.*, Jan.-Feb., 1918.

(2) **Doesschate** has made measurements of the field of vision in flying officers with the aid of the Bjerrum screen. The number of fields observed was 40 and in 18 defects were found varying from absolute to faint relative scotomata. Most of the cases had been

flying for a considerable period and had not regularly worn any form of protection. The scotomata were mainly of the ring type; in only one was the ring complete. The scotomata always appeared first in the temporal part of the field, which the author considers to be due to the protection afforded by the nose. The visual defect had not been noticed by the patients themselves who had come under treatment mainly for conjunctival trouble. Zade (*Arch. f. Ophthal.*, Vol. XCI) recorded similar defects. All the scotomata in Zade's series lay between the 35° and the 50° circle, but in some of Doesschate's cases they were only 25° from the fixation point. In two cases Doesschate found a radial relative scotoma and in one of these there were changes at the macula and central vision was affected. Similar defects have been observed in range finders. The author considers these cases as similar to eclipse blinding and to be due to the more highly refractile rays of light.

E. E. H.

BOOK NOTICES

Contribution to the Pathological Anatomy of Congenital Malformation of the Eye. (Thèse de Gand.) By Dr. G. MARNIX VAN DUYSE. Gand: Imprimerie I. Vanderpoorten, Rue de la Cuiller, 18. 1919.

Dr. G. M. van Duyse describes two specimens derived from a child, aged 5 years.

Specimen I.—The right eye showed a typical complete coloboma of the choroid. The latter did not extend up to the optic disc, but between it and the optic disc was to be seen a white depressed area which proved to be a cystic coloboma. There was also a congenital crescent below the disc. When the eye was removed a small cyst could be seen extending beneath the optic nerve. The cyst was filled with proliferated retina, probably derived both from the inner and outer layers, and was free from pigmentation, as is usually the case. Beyond the margin of the cyst there was a separation between the outer and inner layers of the optic vesicle. The pigmentation of the outer layer of the optic vesicle ceased at the margin of the cyst, and was continued into the cyst without pigmentation. Within the cyst there were also some smaller cysts lined with cylindrical epithelium. The tissue within the cysts consisted principally of glial cells. The margin of the coloboma showed folding of the retina, and the retina close to the margin of the coloboma contained rosette formations. The vitreous had

developed atypically into fibrous bands. The ciliary body and angle varied considerably in different situations. In some places it was atrophied, and in others the pigment was hypertrophied into large masses, and was cystic in one or two situations. The angle of the chamber was in its foetal condition, and the iris was absent from the situation of the coloboma, and the pigmented epithelial layer extended beyond the rudimentary stroma in most situations. The angle of the anterior chamber was in its foetal condition, and the remains of the pupillary membranes were present.

Specimen II.—Left eye from the same case. Specimen of microphthalmos with apparent anophthalmos with a pigmented cystic condition of the orbit and eyelid.

The condition was one of complete failure of closure of the ocular cleft, as the result of which the retinal tissues in the neighbourhood of the cleft below developed into multiple cysts. In the specimen the optic nerve was shown cut obliquely, and a mass of fibrous tissue in front of this was the remains of a rudimentary sclera. Above could be traced the rudimentary choroid and retina; the latter was much folded upon itself, and contained rosette formation. In most situations its outer layers were pigmented. The vitreous was fibrous, and there were two particularly large cysts below, one on either side of the cleft, communicating with the interior of the globe and containing proliferated glial tissue.

M. S. M.

Cuban Review of Ophthalmology. Vol. I, No. 3. (*Revista Cubana de Oftalmologia*), 1919.

The second fasciculus of this journal fully maintains the excellence and originality of the first. The biographical section contains accounts of Uribe y Troncoso, C. H. May, Posey, Pacheco Luna, J. N. Roy, and Velez of Mexico. Santos Fernandez contributes a large number of original articles, mostly short ones, of which those on spring catarrh in Cuba, and homonymous hemianopia after head injury are worthy of note. Uribe y Troncoso writes on endovasculitis of the retinal vessels, Pacheco Luna on trachoma in Guatemala, and on corneal suture in cataract extraction, Gomez on wounds and contusions of the globe. Among the many other original articles, perhaps the most interesting at the present time are those by Oñate and F. M. Fernandez on the ocular complications of influenza. The first-named writer, who practises in Cuba, records a case of metastatic panophthalmitis in a woman, aged 26, who suffered from influenzal broncho-pneumonia; the eye was excised. The same author contributes a paper on post-influenzal amblyopia containing observations on two cases who suffered from mistiness of vision, presumably toxic in origin, after an attack of influenza, for

he could find no organic change in the eye to account for it. No details of the vision or of the presence or absence of a central scotoma are given, and both cases made a good recovery on simple dietetic and medicinal treatment. It is interesting to note that in the first case the visual failure coincided with a sharp attack of urticaria.

F. M. Fernandez records six cases: (1) a man of 38 years, who after influenza presented signs of desquamation of the cornea and an acute iritis, which latter quickly cleared up without leaving any sequelae under appropriate treatment; (2) A case of optic atrophy following a severe attack of influenza in a man of 35 years; syphilis and tubercle were excluded in this case; (3) a case of iritis following influenzal pulmonary congestion; (4) a case of simple corneal ulcer in a youth of 19 years; (5) a case of a man of 47 years, Spaniard, resident in Cuba for many years, who had a leucoma adherens for which Santos Fernandez had performed an iridectomy 30 years before. This man got a sharp attack of secondary glaucoma, with tension +2, which yielded rapidly to miotics; (6) a case of papilloedema consequent on sinusitis due to influenza.

The abstracts of current ophthalmology follow the customary lines and appear to be very complete. The management of this new journal is to be congratulated on its production.

R. R. JAMES.

A New Surgical Treatment for Squint. (Nuevo tratamiento quirúrgico del estrabismo.) By Dr. CASTRESANA. Madrid, 1919. Price 5 pesetas.

THE author in this little pamphlet of 95 pages covers a good deal of the surgical treatment of squint, pointing out the pros and cons as regards simple tenotomy, simple advancement, and the combined operations.

Squint appears to be very common in Spain, and the patients averse from operative treatment, not so much, we gather, from religious prejudices, as has been affirmed, but from the common belief which the masses hold, that the disease has no remedy; such being the case, we imagine that Castresana's pamphlet will go far towards dispelling this popular illusion.

The whole subject is discussed in a judicious manner, while the work is copiously illustrated with plates of cases before and after operation. Castresana's method of operating consists in a combined operation, the first stage being the defining and the freeing of the edges of the internal rectus tendon, without separating it from the globe; having got it free, he stretches the tendon over a squint hook and makes two or more vertical cuts into it at different points

behind its insertion, so as to weaken its action; he then performs a modified Critchett's three stitch advancement on the opponent, and fixes the ends of the suture to the temple with strapping. The after-treatment consists of atropin to the eyes and an occlusion bandage for a week, at the end of which time the refraction is estimated and glasses are ordered if necessary.

R. R. JAMES.

CORRESPONDENCE

THE NOTATION OF AXES OF CYLINDERS

To the Editor of the BRITISH JOURNAL OF OPHTHALMOLOGY.

SIR,—With reference to Mr. Gray Clegg's interesting article in the October issue of the *Journal*, upon the above subject, I may point out that in February, 1910, in a short note to the *Lancet*, I submitted that the difficulty in regard to the question of notation arose from the fact that there was no standard method. "Every method in vogue is a workable method, but there is no uniformity, because there is no common standard, and because these methods lack the basis of a standard which is recognized by the world, about which no confusion can arise, it is impossible to expect any universal agreement." Such a standard, nevertheless, is available, and that is the mariner's compass. In this compass the poles are marked zero, and the equator, or horizontal line, 90°. With this compass as the standard, the axes of the cylinders are simply required to be indicated as so many degrees from zero in approaching the equator, north-east, or north-west, according as the axis is downwards and outwards, or downwards and inwards. Thus by this means it is possible to avoid the confusion which frequently arises by dealing with degrees higher than 90. During the past nine years I have found this method very simple, workable, and convenient.

I am, Sir,

Yours truly,

PERCY DUNN.

LONDON, W.

To the Editor of the BRITISH JOURNAL OF OPHTHALMOLOGY.

SIR,—When prescribing spectacles for a patient, the primary object of employing any standard is to enable the patient to get the correct spectacles from an optician. "Paris inches" are no longer employed and in all countries the dioptre is recognized.

When defining the angle at which the cylinder is to be placed, no such uniformity exists. This is due, at least in part, to ophthalmic surgeons having divers views as to what is most important. In a recent article, "The Notation of Cylinder Axes," by J. Gray Clegg (B.J.O., October, 1919) these views and their divergencies are carefully exposed. These can be divided into two classes, those in which the notation is symmetrical about the nose, and those in which it is similar.

It appears to me that in deciding what method should be adopted, the point most worthy of consideration is what method will enable the optician most easily and accurately to supply the patient with the spectacles the surgeon desires.

From among the many methods employed, the opticians have had to choose that one which most completely fulfils their requirements. Had they chosen any of the methods relying on symmetrical notation about the mid-line they would have required two machines for marking off the lenses, one for the right lens and one for the left, or alternatively two sets of graduations on the one machine—in either case a very fruitful source of error. The result is that they have decided that they will use a notation that is similar in each eye and in which the zero is horizontally on the left hand side as one faces the patient, and the numbers are marked, increasing from left to right, on the lower part of the frame. This they call the "Standard" notation.

My enquiries lead me to believe that every optician in London, with one exception, employs this method and that when a patient takes a prescription to an optician, the axis is invariably transcribed into this form before it is sent into the workshops to be made up.

In view of the fact that error is less likely to arise if the optician has merely to transcribe the axis rather that translate it, it would appear that it is to the patient's advantage that the surgeon should employ the "Standard" notation.

Yours, etc.,

B. T. LANG.

LONDON, W.